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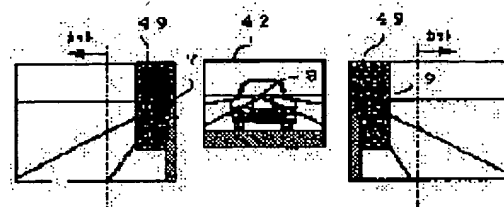
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(54) VEHICLE SURROUNDING CONDITION DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide the left, right and rear road conditions as continuous information and to instantaneously grasp the entire conditions by matching the infinite far points of three left side, right side and rear images at least and synthesizing the left side, right side and rear images so as to watch from one virtual viewpoint.

SOLUTION: When the left, right and rear sides of vehicle are photographed by CCD cameras having the same view angle, the vehicle positioned back in the relation of distance between the camera and the vehicle is projected a little smaller for the lateral image and projected a little larger for a rear image 42. Therefore, in order to display the image just like watching from one viewpoint (from the front side of vehicle, for example), the rear image 42 is reduced so as to match the size of image projected in the rear image 42 with the size of image projected in left and right side images. Then, the outside part of left and right side images is cut while considering the form of meter cluster, afterwards, one part 49 of left and right side image overlapped with the rear image 42 is cut, image processing is performed so as to match infinite far points 7, 8 and 9 of three images and one viewpoint image is prepared.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the car circumference situation display equipment which displays simultaneously especially the image of right and left and back on a liquid crystal panel about the equipment which displays the circumference situation of a car.

[0002]

[Description of the Prior Art] As an approach of grasping the situation of the car exterior, it is the mainstream [according to / the side / according to a room mirror in back / mainstream / fender mirror / a door mirror or] of a current commercial vehicle. Other than this, a part of graphic display to the liquid crystal panel of the instrument panel by the CCD camera is also then exhibited as utilization or a prototype. For example, there are what displays the image of the method of the left right-hand side photoed with the CCD camera and back on the boundary line on a windshield and the top face of an instrument panel, and a thing as which the image of the vehicle approached with warning when the vehicle has approached is displayed.

[0003]

[Problem(s) to be Solved by the Invention] However, the image of the method of left right-hand side and back projects the above-mentioned conventional display independently, and a driver requires time amount in order to grasp all circumference situations and to have to recognize each one image of every. If it says about what displays the image of the method of the left right-hand side photoed with the CCD camera of the above-mentioned conventional example, and back, each screens are separated and it is necessary to see near and each screen to the function of a room mirror and a door mirror. If it says about what it approaches and the image of a vehicle is displayed as with warning, only the side or a back screen will be displayed and it will be hard to grasp the whole. It is making the whole easy to make this invention in view of the conventional trouble, and for the object to acquire right and left and a back route situation as continuous information in an instant, and to grasp.

[0004]

[Means for Solving the Problem] In order that this invention may attain said object, the infinite point of at least three images of the method of left right-hand side and back is doubled. So that image composition of the method of left right hand side and the back image may be carried out as seen from one virtual view, and the magnitude of the image of the method image of left right-hand side and a back image may be doubled The dip of a back image is made smaller than the dip of the method image of left right-hand side. Image size at the time of low medium-speed transit By it being small and enlarging at the time of high-speed transit, shifting to the image of the direction at which the image displayed on a panel turns at the same time it takes out a blinker, and detecting the variation rate of the car body under transit by the irregularity of a road surface by the sensor It is considering as the car circumference situation display equipment from which the shake of the image accompanying the variation rate of a car body is removed.

[0005]

[Function] According to this invention of the above-mentioned configuration, a motion of the car which runs right and left and back can grasp at a glance, and it becomes easy to carry out prior evasion of risk by displaying that right and left and a back image were simultaneously seen from one view. the back case where the car made a lane change and advances into the left of a self-vehicle, or a right lane -- right and left -- after seeing one of screens and grasping existence of a car, actuation of the two-step style of seeing a back screen and recognizing having made a lane change

cannot be needed, a motion of a car can grasp continuously, and the time amount which grasps a secondary road situation is short, and ends. Moreover, by making the dip of a back image smaller than the dip of the method image of left right-hand side, an image on either side is reflected as seen from near the virtual view, and a back image is reflected so that it may be visible far away from a virtual view, so that the magnitude of the image of the method image of left right-hand side and a back image may be doubled. Thereby, depth perception is expressed. The difference of the dip of the method screen of left right-hand side and a back screen expresses the car-body order length of a car. It becomes easy to hold a sense of distance with a perimeter by showing the back end of a trunk as a back image, and showing a right-and-left door outer edge as the method image of left right-hand side. Although the angle of visibility of the car side becomes easy to carry out breadth and grasp of the route which was [urban area] congested by a longitudinal direction becoming legible more at the time of low-speed transit and the angle of visibility of the car side becomes narrow at the time of high-speed transit when image size is small at the time of low-speed transit and becomes large at it at the time of high-speed transit, it becomes easy to hold a sense of distance with a back car. Moreover, when a display image takes out a blinker at the time of lane modification or right left turn at a crossing, it can project to a longitudinal direction more and becomes easy to prevent contamination, such as contact on other vehicles, and a motorbike, in advance by shifting to the image of the travelling direction of a self-vehicle. Moreover, an always clean car circumference image can be seen by detecting the variation rate of the car body by the irregularity of a road surface by the acceleration sensor, feeding back to a display image, and removing the shake of an image.

[0006]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail based on drawing. Drawing 1 is the schematic diagram having shown the attachment situation of the car circumference situation display equipment of the gestalt of operation of this invention. A liquid crystal panel 2 is fundamentally embedded in the front of a driver, and the meter cluster 1, and a car circumference situation is displayed on a liquid crystal panel 2. A liquid crystal panel 2 can display various information, such as the vehicle speed and an engine speed, besides a car circumference situation. Drawing 2 shows the car circumference situation display of this invention displayed on a liquid crystal panel 2, and the display screen consists of a left side screen 3, a right side screen 4, and a back screen 5. The image displayed on each screen is photoed with the CCD camera attached in the car body.

[0007] One proposal of a camera installation location is shown in drawing 3. It installs in a right-and-left door mirror with 31 and 32 two CCD cameras, and 33 is installed near a trunk one CCD camera. CCD camera 31 is an angle of visibility 34 about a left side image, in CCD camera 32, a right side image is photoed with an angle of visibility 35, and CCD camera 33 photos a back image with an angle of visibility 36. Here, as those images are shown in drawing 17 by the conventional approach, one infinite point 107 exists in the image of the left side screen 103, one infinite point 109 exists also in the image of the right side screen 104, and one infinite point 108 exists also in the image of the back screen 105. That is, three images have an infinite point in each, and the image of three screens is not continuing. Therefore, in order to grasp a surrounding route situation, it must recognize the image of right and left and back at a time according to [one] an individual, and time amount will be taken. In addition, as for a left door outer and 129, 128 in drawing is [a right door outer and 130] the trunk back end. Moreover, the white line on a road surface [in / in 116, 117 / the image of the left side screen 103], the white line on a road surface [in / in 122, 123 and 124 / the image of the right side screen 104] and a horizon, and 118, 119, 120, 121 are the white lines on the road surface in the image of the back screen 105.

[0008] In the display of this invention shown in drawing 2 as the cure, the infinite points 107, 108, and 109 of the conventional example shown in drawing 17 were collected to one infinite point 6, and as seen from one virtual view 37 (refer to drawing 3), the image of three screens 3, 4, and 5 was compounded. For example, the white line 116 and white line 118 on the route in drawing 17 turn into a white line 10 in drawing 2, and white lines 117 and 119 turn into a white line 11. Similarly, a white line 123 and a white line 121 turn into a white line 14, and a white line 122 and a white line 120 turn into a white line 13. 15 is a horizontal line.

[0009] Therefore, by displaying that the image of right and left and back was seen from one view 37 as mentioned above, the route situation around a self-vehicle can be grasped quickly, and it leads to prior evasion of risk.

[0010] The image captured with the CCD camera considers the thing of 3:4 displayed on a liquid crystal panel that it is oblong and as greatly as possible, and cuts and displays a longitudinal direction rather than the real image pick-up range of the method image of left right-hand side. In drawing 4, although the real image pick-up range of the left side is a frame 38, a display is taken as the magnitude shown on said left side screen 3. The real image pick-up range 39

makes the right side similarly the magnitude shown on the right side screen 4. The back real image pick-up range 40 is not carried out, but displays a large cut in the magnitude which reduced the image captured mostly as it was, and was shown on said back screen 5.

[0011] Then, one composite procedure is explained. If car right and left and back are photoed with the CCD camera of the same angle of visibility, and especially an image processing is not carried out, as shown in drawing 5, to the car 46 which is present in a certain location, by the right-and-left images 41 and 43, it will be reflected more smallish, and will be more greatly reflected by the back image 42. This is because the distance from a camera to the car is different. Since the body which is in the location same for displaying as seen from one view 37 (refer to drawing 3) must be the same magnitude, it reduces the back image 42 in order to make the magnitude of the image 46 reflected in the back image 42 meet the images 44 and 45 reflected in the method images 41 and 43 of left right-hand side. If drawing 6 - drawing 10 explain image composition processing for this, in order to project the image beside a car in as large the range as possible, the lengthwise direction of the method image of left right-hand side is arranged to the lengthwise direction maximum width 47 of a liquid crystal panel 2. If the configuration of the meter cluster 1 is taken into consideration, the method image of left right-hand side will not have been settled, and an outside 48 will be cut. then, it is with the back image 42 -- some beaten method images 49 of left right-hand side are cut, an image processing is performed and 1 view image is created like drawing 9 so that infinite points 7, 8, and 9 may be doubled.

[0012] The edges 25 and 26 of a door outer are reflected in the method image of left right-hand side, and it is made for the trunk back end 27 to be reflected in a back image at this time. This becomes easy to grasp a sense of distance with other vehicles. Moreover, the difference of the dip of the method screens 3 and 4 of left right-hand side and the back screen 5 shows car-body order length, and is expressing depth perception. This level difference can also be used like drawing 10, and a self-vehicle can also be expressed by CG50.

[0013] (Gestalt of other operations) Hereafter, although the gestalt of other operations is explained, the same sign is given to the same component as the gestalt of said operation, and the explanation is omitted.

[0014] A composite procedure (a) and (b) are shown in drawing 11 as a gestalt of other operations. Deformation of the screen of the side is lessened. (a) and (b) show the display screen at the time of the vehicle speed being low medium speed, and the time of being a high speed to drawing 12. Low medium speed is mainly street transit. In such a comparatively crowded situation, when making a lane change, other vehicles are running horizontally in many cases. Therefore, it is necessary to get to know the route situation beside a self-vehicle to a wide angle as much as possible. Then, at the time of low medium speed, as shown in (a), it is made into the reduced screen 51 which reduced image size in the range which can recognize a back image. On the contrary, to high-speed transit, since the vehicle speed is quick, when making a lane change, it is important to hold a sense of distance with other vehicles, but if the magnitude of the vehicle in which it is reflected is small, it will be hard to hold a sense of distance. Then, it is better to display as an amplification screen 52 which expanded the back image even if it deleted the information on horizontal somewhat, as shown in (b).

[0015] Moreover, when the usual display is what is shown in drawing 13, when a blinker is taken out at the time of lane modification or right left turn at a crossing, as shown in drawing 14, the image of the direction upon which a self-vehicle trespasses shifts to central one, and a lateral image can be checked and it becomes easier to avoid contact on other vehicles, the contamination of a motorbike, etc. As shown in drawing 4 from the first, since the real image pick-up range 38 is wider than a viewing area (screen) 3, if it shifts, a horizontal image can be displayed more.

[0016] In order to always show the above displays clear, also when it runs the place as for which the road surface is carrying out irregularity, it considers as the following systems so that a screen may not shake. As shown in drawing 15 (a) and (b), it detects by the acceleration sensor 53 which attached the oscillation from a road surface in the suspension etc. As shown in drawing 16 after that, a certain instruction which will amend the shake of a screen if it detects for time amount t seconds is taken out from the control unit outside drawing in the oscillation of the amplitude of a certain field alpha, and a frequency. The instruction of amendment is map-ized by the amplitude and frequency which are detected, and corresponding amendment is made. However, when the condition that there are no amplitude and frequency in a certain field alpha is detected for s seconds, amendment control stops. In addition, since the real image pick-up range 38, 39, and 40 is larger than viewing areas (screen) 3, 4, and 5, it uses at this rate as a molding allowance.

[0017]

[Effect of the Invention] As explained above, according to the car circumference situation display equipment by this invention, a motion of the car which runs right and left and back can grasp at a glance, and it becomes easy to carry out

prior evasion of risk by displaying that right and left and a back image were simultaneously seen from one view. the back case where the car made a lane change and trespasses upon the left of a self-vehicle, or a right lane -- right and left -- after seeing one of screens and grasping existence of a car, actuation of the two step style of seeing a back screen and recognizing having made a lane change cannot be needed, a motion of a car can grasp continuously, and the time amount which grasps a secondary road situation is short, and ends. Moreover, by making the dip of a back image smaller than the dip of the method image of left right-hand side, an image on either side is reflected as seen from near the virtual view, and a back image is reflected so that it may be visible far away from a virtual view, so that the magnitude of the image of the method image of left right-hand side and a back image may be doubled. Thereby, depth perception is expressed. The difference of the dip of the method screen of left right-hand side and a back screen expresses the car-body order length of a car. It becomes easy to hold a sense of distance with a perimeter by showing the back end of a trunk as a back image, and showing a right-and-left door out edge as the method image of left right-hand side. Although the angle of visibility of the car side becomes easy to carry out breadth and grasp of the route which was [urban area] congested by a longitudinal direction becoming legible more at the time of low-speed transit and the angle of visibility of the car side becomes narrow at the time of high-speed transit when image size is small at the time of low-speed transit and becomes large at it at the time of high-speed transit, it becomes easy to hold a sense of distance with a back car. Moreover, when a display image takes out a blinker at the time of lane modification or right left turn at a crossing, it can project to a longitudinal direction more and becomes easy to prevent contamination, such as contact on other vehicles, and a motorbike, in advance by shifting to the image of the travelling direction of a self-vehicle.

[0018] Moreover, an always clean car circumference image can be seen by detecting the variation rate of the car body by the irregularity of a road surface by the acceleration sensor, feeding back to a display image, and removing the shake of an image.

[Translation done.]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION
TECHNICAL PROBLEM MEANS OPERATION DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

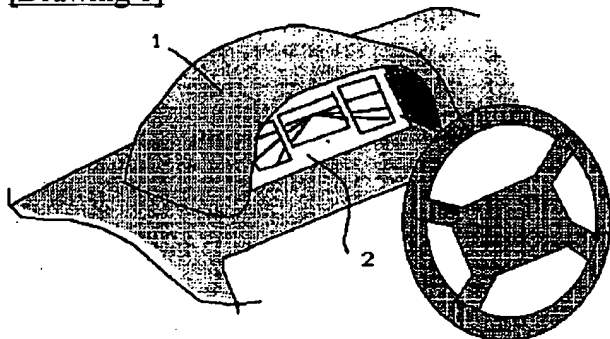
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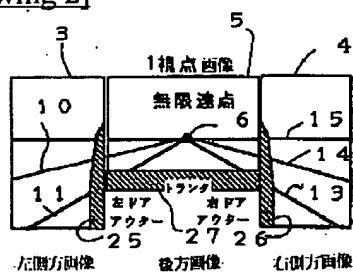
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DRAWINGS

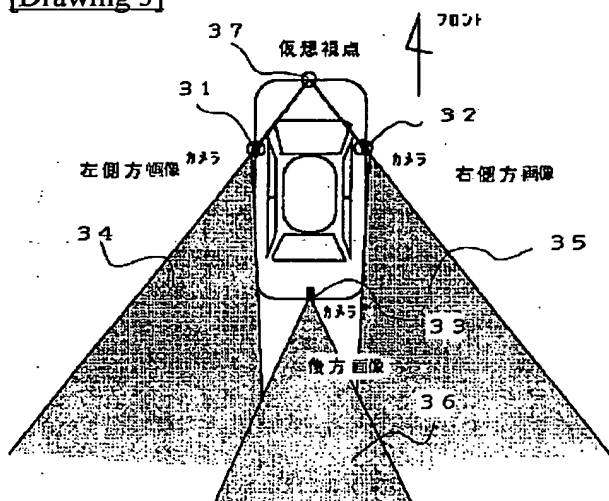
[Drawing 1]



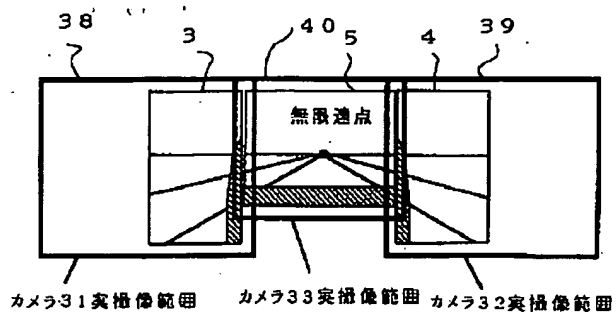
[Drawing 2]



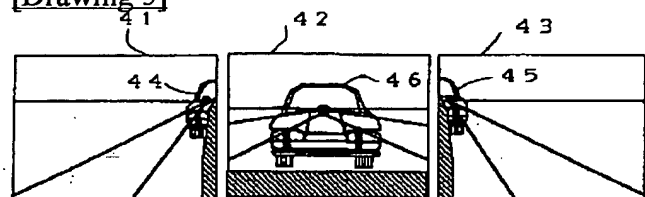
[Drawing 3]



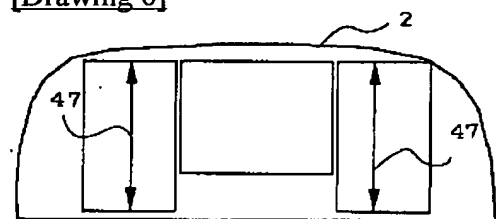
[Drawing 4]



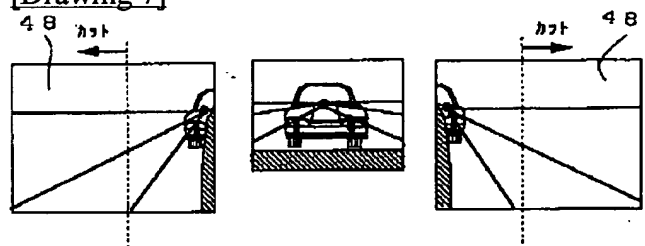
[Drawing 5]



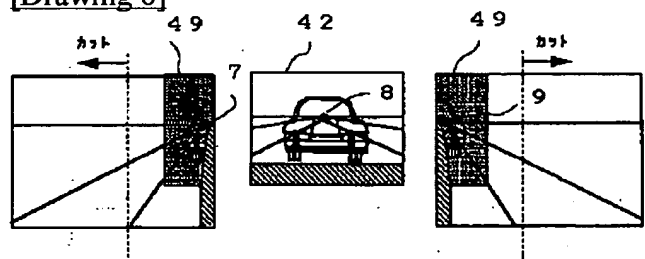
[Drawing 6]



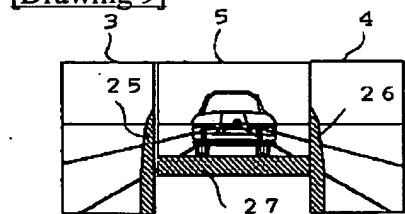
[Drawing 7]



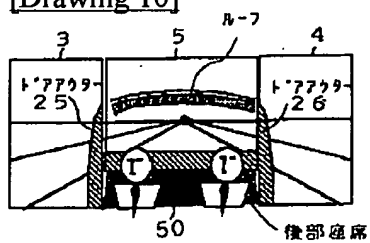
[Drawing 8]



[Drawing 9]

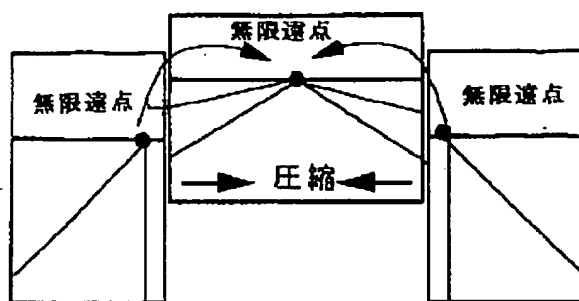


[Drawing 10]

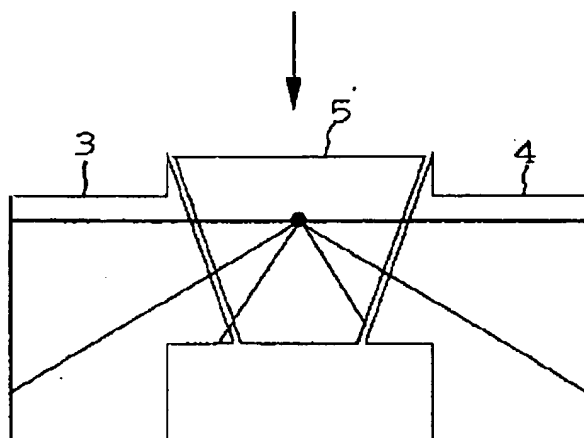


[Drawing 11]

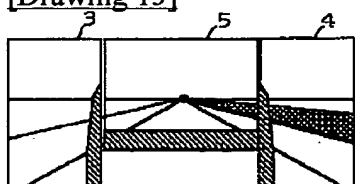
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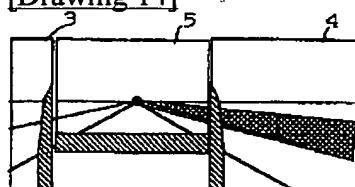
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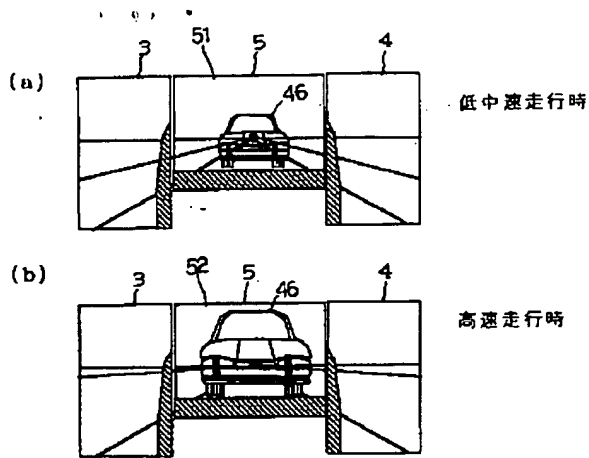
[Drawing 13]



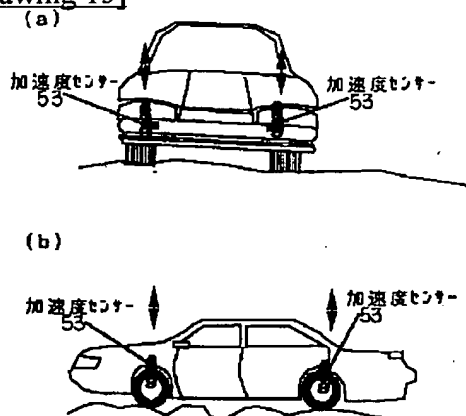
[Drawing 14]



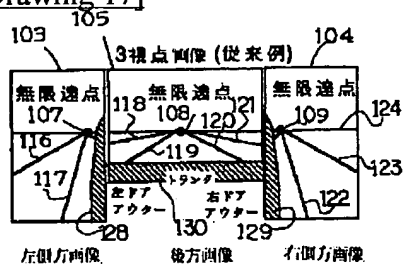
[Drawing 12]



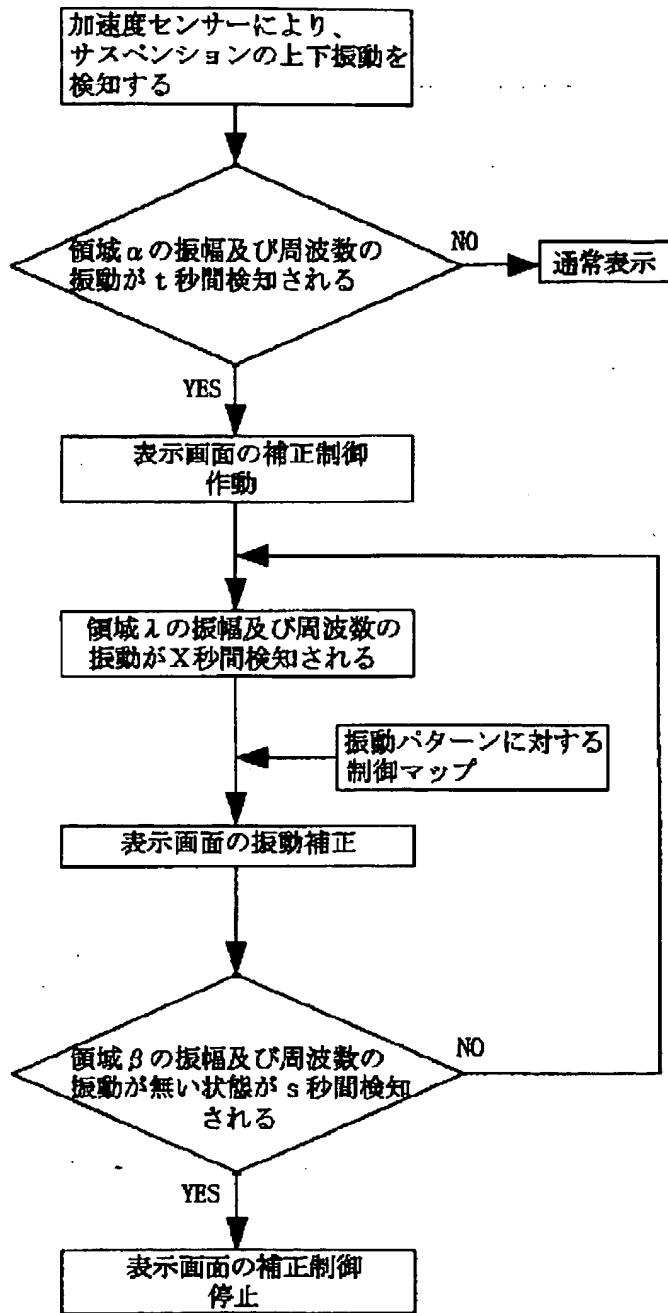
[Drawing 15]



[Drawing 17]



[Drawing 16]



[Translation done.]